

references to notification interfaces to find the corresponding notification interface reference. The method Unadvise then removes the references to the corresponding notification interface from the list of connected notification interfaces, thus disconnecting the corresponding notification interface.

Code TABLE 5

```
interface IProvideClassInfo: public IUnknown {
    virtual HRESULT GetClassInfo(ITypeInfo **ppdi, CLSID lcid) = 0;
}
```

Code Table 5 contains C++ pseudocode for a preferred definition of the interface IProvideClassInfo, which can be used by a sink object to obtain information about an unknown source object. The method GetClassInfo of the IProvideClassInfo interface can be used by a sink or initiator object to obtain class and type information from an unknown source object in order to connect to it. The ITypeInfo interface describes the interfaces implemented by the source object, what events it raises, and what properties it supports. A sink or initiator object can then use this information to set up compatible connections. The ITypeInfo interface is described in detail in U.S. patent application Ser. No. 07/959,056, entitled "Method and System for Interfacing to a Type Library," which is hereby incorporated by reference.

Although the present invention has been described in terms of a preferred embodiment, it is not intended that the invention be limited to this embodiment. Modifications within the spirit of the invention will be apparent to those skilled in the art. The scope of the present invention is defined by the claims which follow.

We claim:

1. A method in a computer system for generating an object connection between a source object and a sink object, the sink object having an instance of an interface that serves as a notification interface for receiving communications from the source object, the notification interface having an associated interface identifier, the source object having instances of a connection point interface, the method comprising the steps of:

receiving a request having an indication of the interface identifier associated with the notification interface of the sink object;

selecting an instance of the connection point interface from among the instances of the connection point interface of the source object wherein the selection of the instance is based upon the interface identifier indicated in the received request;

sending a reference to the selected connection point interface instance;

receiving, through the selected connection point interface instance, a request to connect the source object and the sink object, the request having a reference to the notification interface instance of the sink object; and

storing the reference to the notification interface instance, wherein the source object communicates with the sink object using the stored reference to the notification interface instance.

2. A method in a computer system for notifying a sink object from a source object, the sink object connected to the source object in accordance with the method of claim 1, including the step of, under control of the source object, invoking a member function of the notification interface instance referred to by the stored reference.

3. The method of claim 1, the selected connection point interface instance for connecting to a plurality of sink

Sub B1

objects, wherein the steps of receiving the request to connect and storing the reference to the notification interface instance are performed for each sink object, and further including the step of:

15 for each sink object, invoking a member function of the notification interface instance referred to by the stored reference.

20 4. The method of claim 1, the source object having a connection point container object for managing interaction with the instances of the connection point interface and wherein the step of selecting the instance of the connection point interface includes the substep of requesting the instance of the connection point interface from the connection point container object.

25 5. The method of claim 1, the connection point interface having an advise member function for requesting a connection to the source object, wherein the step of receiving the request to connect is performed by invoking the advise member function of the selected connection point interface instance.

30 6. The method of claim 1 wherein the step of selecting the instance of the connection point interface is performed under the control of code of the source object.

35 7. The method of claim 6 wherein the step of receiving the request to connect is performed under the control of code of the source object.

40 8. The method of claim 6, further comprising the step of, under the control of code of the sink object, requesting a connection.

45 9. The method of claim 1 wherein the step of storing the reference to the notification interface instance is performed under the control of code of the source object.

50 10. The method of claim 9, further comprising the step of, under the control of code of the sink object, requesting a connection.

55 11. The method of claim 1, further comprising the step of, under control of code of the sink object, requesting a connection.

60 12. The method of claim 1, the computer system having an initiator object for setting up connections between the source object and the sink object, further comprising the step of, under control of the initiator object, requesting a connection.

65 13. A method in a computer system for registering with a source object an instance of an interface that serves as a notification interface of a sink object, the source object having a registration function member for registering the notification interface of the sink object, the notification interface instance for communicating with the sink object from the source object, the sink object having a plurality of notification interfaces, each notification interface having at least one instance, the method including the steps of:

66 receiving a reference to the registration function member of the source object;

67 selecting the instance of the notification interface to be registered from the plurality of instances of notification interfaces; and

68 requesting registration of the selected notification interface instance using the received reference to the reg-

istration function member of the source object, wherein the source object registers the selected notification interface instance and communicate with the sink object using the registered interface instance.

14. The method of claim 13, the source object having an advise member function for requesting registration of a notification interface, and wherein the step of requesting registration invokes the advise member function of the source object to make the request.

15. The method of claim 13, the sink object having an instance of an IUnknown interface for accessing other interfaces of the sink object, and wherein the step of selecting the instance of the notification interface selects the instance of the IUnknown interface of the sink object.

16. The method of claim 13 wherein the step of requesting registration is performed under the control of the sink object.

Sub B2⁴⁵ 7
17. The method of claim 16 wherein the step of selecting the instance notification interface is performed under the control of the sink object.

18. The method of claim 13, the computer system having an initiator object for registering a notification interface of a sink object, wherein all steps are performed by the initiator object.

19. A method in a computer system for notifying a sink object from a source object using a delegate object, the sink object having a sink notification interface for notifying the sink object, the delegate object having a delegate notification interface for notifying the delegate object, the delegate notification interface having an associated interface identifier, the source object having instances of a connection point interface for connecting the delegate object, the method comprising the steps of:

storing, in the delegate object, a reference to an instance of the sink notification interface;

selecting an instance of the connection point interface from among the instances of the connection point interface of the source object, wherein the selection of the instance is based upon the interface identifier associated with the delegate notification interface;

sending, to the delegate object, a reference to the selected connection point interface instance;

receiving, through the selected connection point interface instance, a request to connect the source object and the delegate object, the request having a reference to an instance of the delegate notification interface;

storing the reference to the delegate notification interface instance;

invoking a method of the delegate notification interface instance that is referred to by the stored reference; and

invoking a method of the sink notification interface instance referred to by the stored reference in the delegate object to effect the notification of the sink object.

20. The method of claim 19, the computer system having an initiator object for setting up connections between the source object and the delegate object, and further comprising the step of, under control of the initiator object, requesting a connection.

21. A method in a computer system for generating an object connection between a source object and a sink object, the sink object having a notification interface for communicating with the sink object, the notification interface having an associated interface identifier, the source object having a plurality of connection point objects for connecting the sink object, each connection point object having an instance of the same connection point interface, the method comprising the steps of:

sending, to the source object, an indication of the interface identifier associated with the notification interface of the sink object;

5 selecting a connection point object from among the plurality of connection point objects based upon the indication of the interface identifier;

requesting a connection, from the instance of the connection point interface of the selected connection point object, to connect the source object and the sink object;

10 indicating an instance of the notification interface of the sink object in the connection request;

receiving the connection request; and

storing a reference to the indicated instance of the notification interface of the sink object.

15 22. The method of claim 21, further including the step of, under control of code of the source object, invoking a method of the indicated notification interface instance referred to by the stored reference.

23. The method of claim 21, the source object having

20 connection point container object for managing interaction with the plurality of connection point objects and wherein the step of selecting the connection point object includes the substep of requesting the connection point object from the connection point container object.

25 24. The method of claim 21, the connection point interface having an advise member function, wherein the step of requesting the connection from the instance of the connection point interface of the selected connection point object invokes the advise member function of the instance of the connection point interface to make the request.

30 25. The method of claim 21, the selected connection point object for connecting to a plurality of sink objects, wherein the steps of requesting the connection, indicating the notification interface instance of the sink object, receiving the connection request, and storing the reference to the indicated

35 notification interface instance are performed for each sink object, and further including the step of:

invoking a method of the indicated notification interface instance referred to by the stored reference for each sink object.

40 26. A method in a computer system for generating an object connection between a source object and a sink object, the sink object having an instance of a notification interface for receiving communications from the source object, the notification interface having an associated interface identifier, the source object having instances of a connection point interface, the method comprising the steps of:

under control of the sink object, sending to the source object a request having an indication of the interface identifier associated with the notification interface of

50 the sink object;

under control of the source object,

selecting an instance of the connection point interface from among the instances of the connection point interface of the source object, wherein the selection of the instance is based upon the interface identifier associated with notification interface of the sink object; and

55 sending, to the sink object, a reference to the selected connection point interface instance;

under control of the sink object, requesting a connection from the selected connection point instance to connect the source object and the sink object, the request having a reference to the notification interface instance of the sink object; and

60 under control of the source object, storing the reference to the notification interface instance.

65

27. A method in a computer system for generating an object connection between a source object and a sink object, the sink object implementing a plurality of notification interfaces for communicating with the sink object, each notification interface having an associated interface identifier, the source object having instances of a connection point interface, each instance of the connection point interface having an associated interface identifier, the method comprising the steps of:

- selecting a notification interface form among the plurality of notification interfaces of the sink object;
- selecting an instance of the connection point interface of the source object, the selected instance having an associated interface identifier that corresponds to the interface identifier associated with the selected notification interface of the sink object;
- using the selected connection point interface instance to request that the source object and the sink object be connected, wherein the request has a reference to an instance of the selected notification interface of the sink object; and
- storing the reference to the instance of the selected notification interface, so that the sink object can be notified by the source object.

28. The method of claim 27, further including the step of invoking a method of the selected notification interface instance referred to by the stored reference.

29. The method of claim 27, the selected connection point interface instance for connecting to a plurality of sink objects, wherein the steps of using the selected connection point interface instance to request that the source object and the sink object be connected and storing the reference to the selected notification interface instance are performed for each sink object, and further including the step of:

- invoking a method of the selected notification interface instance referred to by the stored reference for each sink object.

30. The method of claim 27, the source object having a connection point container object for managing interaction with the instances of the connection point interface and wherein the step of selecting the instance of the connection point interface includes the substep of requesting the instance of the connection point interface from the connection point container object.

31. The method of claim 27, the connection point interface having an advise member function for requesting a connection to the source object, wherein the step of using the selected connection point interface instance invokes the advise member function of the selected connection point interface instance.

32. The method of claim 27 wherein the step of selecting the instance of the connection point interface is performed under the control of code of the source object.

33. The method of claim 32, further comprising the step of, under the control of code of the sink object, requesting a connection from the selected connection point interface instance.

34. The method of claim 33 wherein the step of selecting the notification interface is performed under the control of the sink object.

35. The method of claim 27 wherein the step of storing the reference to the notification interface instance is performed under the control of the source object.

36. The method of claim 35, further comprising the step of, under the control of the sink object, requesting a connection from the selected connection point interface instance.

37. The method of claim 27, further comprising the step of, under the control of the sink object, requesting a connection from the selected connection point interface instance.

5 38. The method of claim 27, the computer system having an initiator object for setting up connections between the source object and the sink object, further comprising the step of, under control of the initiator object, requesting a connection; and indicating an instance of the notification interface of the sink object in the connection request.

10 39. A computer system for dynamically connecting objects, the system comprising:

15 a plurality of sink objects, each sink object having a notification function member for communicating with the sink object from the source object; and

20 a plurality of source objects, each source object having a plurality of connection point objects, each connection point object storing a plurality of notification function members and returning an identification of one of the notification function members from the stored plurality of notification function members upon request.

25 40. The system of claim 39, further comprising a connection point container for storing the plurality of connection point objects within each source object, the connection point container determining which connection point object to use when an object connection is requested.

30 41. The system of claim 39, further comprising an invocation mechanism used by each of the connection point objects to invoke one of the stored notification function members.

35 42. A method in a computer system for generating an object connection between a source object and a sink object, the sink object having an instance of a notification interface for receiving communications from the source object, the notification interface having an associated interface identifier, the source object having instances of a connection point interface, each instance of the connection point interface having an associated interface identifier, the method comprising the steps of:

40 receiving a request to enumerate the instances of the connection point interface;

45 sending a reference to each instance of the connection point interface, wherein from each reference the sink object obtains an indication of the interface identifier associated with the instance;

50 receiving, through one of the instances of the connection point interface, a request to connect the source object and the sink object, the request having a reference to the notification interface instance of the sink object, wherein the interface identifier associated with the receiving connection point interface corresponds to the interface identifier associated with the notification interface of the sink object; and

55 storing the reference to the notification interface instance, wherein the source object communicates with the sink object using the stored reference to the notification interface instance.

60 43. A method in a computer system for generating an object connection between a source object and a sink object, the sink object implementing a plurality of notification interfaces for receiving communications from the source object, each notification interface having an associated interface identifier, the source object having instances of a connection point interface, each instance of the connection point interface having an associated interface identifier, the method comprising the steps of:

- receiving a request to enumerate the instances of the connection point interface;
- sending to the sink object a reference to each instance of the connection point interface;
- obtaining, from each referenced instance of the connection point interface, an indication of the interface identifier associated with each instance of the connection point interface;
- selecting an instance of the connection point interface of the source object, the selected instance having an associated interface identifier that corresponds to a selected one of the obtained indications of interface identifiers;
- selecting, from among the plurality of notification interfaces, a notification interface, the interface identifier associated with the selected notification interface corresponding to the interface identifier associated with the selected connection point interface instance;
- using the selected connection point interface instance to request that the source object and the sink object be connected, wherein the request has a reference to an instance of the selected notification interface of the sink object; and
- storing the reference to the instance of the selected notification interface, so that the sink object can be notified by the source object.

44. A computer system for notifying a sink object from a source object, the computer system having a plurality of sink objects and source objects, each sink object having a plu-

26

rality of notification function members, each source object having a plurality of connection points for storing one or more notification function members, the system comprising:

- 5 means for selecting a notification function member from among the plurality of function members of the sink object;
- 10 means for selecting a corresponding connection point from among the plurality of connection points of the source object, the selection based upon the notification function member that is selected by the notification function member selection means;
- 15 means for connecting the connection point selected by the connection point selection means and the notification function member selected by the notification member selection means, wherein a reference to the selected notification function member is stored within the selected connection point; and
- 20 means for invoking the selected notification function member referred to by the stored reference to effect notification of the sink object.

45. The system of claim 44 wherein the plurality of connection points of each source object is stored within a connection point container, and wherein the means for selecting a connection point uses the connection point container to determine which connection point to select.

CONNECTION

Sub B3

25

* * * * *

add A1

"Express Mail" mailing label number: EM 153178762US

Date of Deposit: JANUARY 16, 1998

I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231

Printed Name VALENIE STUDER

Signature Valerie Studer